

Developing Transition Edge Sensors for New Space-Based Applications

Completed Technology Project (2011 - 2015)



Project Introduction

High resolution spectroscopy with thermal detectors shows great promise for making astrophysical discoveries across the electromagnetic spectrum, from radio to gamma-rays. These investigations are critical to advancing our understanding of many astrophysical problems related to investigating the structure and evolution of the universe and the origins of the elements, all fundamental NASA goals. Transition Edge Sensor microcalorimeters and bolometers have been highly successful in ground and balloon-based experiments, and technology development is underway to take the next step and operate a TES array in space. Transition Edge Sensors are a versatile and still-developing technology, with applications ranging from astrophysical investigations like the cosmic microwave background and X-ray spectroscopy to potential industrial applications like compact, high resolution X-ray microanalysis instruments. The goal of my investigation is to develop transition edge sensor technology that can be used for a new space-based application, the study of the diffuse soft x-ray background. Diffuse background studies make stringent demands on many different aspects of detector design. Therefore, the new TES technology developed in such an investigation can benefit a variety of applications. With this in mind, my research plan includes learning about space hardware and instrumentation by preparing for a sounding rocket flight that will obtain a high resolution spectrum of the soft X-ray background with a thermistor microcalorimeter array. This will help me build a solid background in instrument science, which I will apply to overcoming the technical challenges associated with building a large-area high energy resolution array of transition edge sensors needed to study the diffuse background.

Anticipated Benefits

Diffuse background studies make stringent demands on many different aspects of detector design. Therefore, the new TES technology developed in this investigation can benefit a variety of applications. With this in mind, my research plan includes learning about space hardware and instrumentation by preparing for a sounding rocket flight that will obtain a high resolution spectrum of the soft X-ray background with a thermistor microcalorimeter array.



Project Image Developing Transition Edge Sensors for New Space-Based Applications

Table of Contents

| | |
|--|---|
| Project Introduction | 1 |
| Anticipated Benefits | 1 |
| Organizational Responsibility | 1 |
| Primary U.S. Work Locations and Key Partners | 2 |
| Project Management | 2 |
| Technology Maturity (TRL) | 2 |
| Technology Areas | 2 |
| Images | 3 |
| Project Website: | 3 |

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

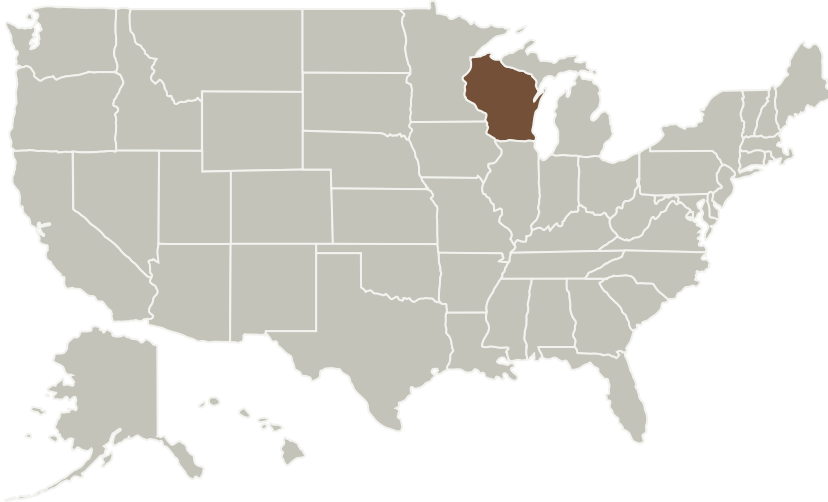
Space Technology Research Grants

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Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---------------------------------|-------------------------|----------|--------------------|
| University of Wisconsin-Madison | Supporting Organization | Academia | Madison, Wisconsin |

Primary U.S. Work Locations

Wisconsin

Project Management

Program Director:

Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Dan Mccammon

Co-Investigator:

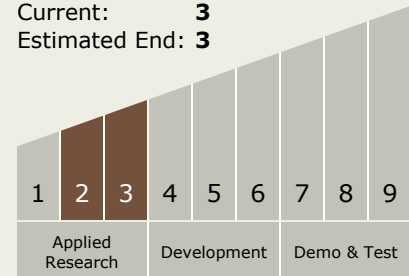
Kelsey Morgan

Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - TX08.1 Remote Sensing Instruments/Sensors
 - TX08.1.1 Detectors and Focal Planes

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Images



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Project Image Developing
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(<https://techport.nasa.gov/image/1744>)

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>